

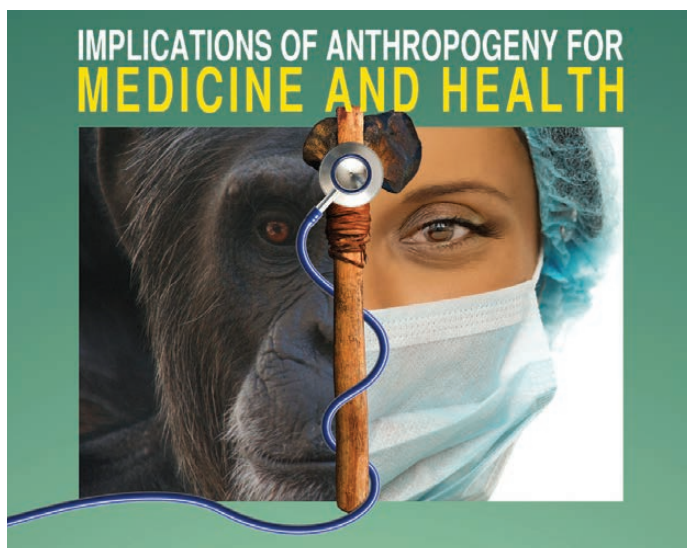


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a CARTA newsletter

Volume 4, Issue 3 - October 2016

Modern Medicine Can Greatly Benefit From Understanding Human Evolution



Modern medicine continues to profoundly transform the human experience, however, many questions remain as to why we get sick and age. Our evolutionary history involves constraints and trade-offs that contribute to how we develop, live, and reproduce. An evolutionary perspective is thus crucial for understanding the diseases of our species, as well as improving medical care as global human populations grow and age.

CARTA's Fall 2016 symposium, **Implications of Anthropogeny for Medicine and Health**, explores this vital topic. Featured experts (listed, right) will discuss the application of evolutionary biology, in the context of human origins, to the prevention and treatment of various illnesses and diseases. Topics include obesity and other metabolic diseases, sleep disorders, problems associated with reproductive health, and disorders resulting from inappropriate immune responses, and environmental adaptations.

In addition to these scholarly experts, award-winning scientific poet, rap artist, and playwright, Baba Brinkman, will perform select songs from his **The Rap Guide to Medicine** album.

This symposium is made possible by **The G. Harold and Leila Y. Mathers Charitable Foundation** and co-sponsored by the **Arizona State University Center for Evolution and Medicine**.

The outstanding lineup of speakers features:

Zoobiquity and "One Medicine"

Barbara Natterson-Horowitz, UCLA

Are there Human-Specific Diseases?

Ajit Varki, UC San Diego

Evolving Milk

Katie Hinde, Arizona State University

Heart Disease in Hunter-Gatherers?

Michael Gurven, UC Santa Barbara

Homeostasis, Inflammation and Disease

Ruslan Medzhitov, Yale School of Medicine

Why Genes that Harm Health Persist

Randolph Nesse, Arizona State University

The Divided Child

David Haig, Harvard University

Adaptations to High Altitude

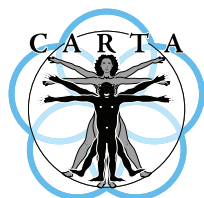
Cynthia Beall, Case Western Reserve University

Shining Evolutionary Light on Human Sleep and Health

Charles Nunn, Duke University

Symposium Details

- Friday, October 14, 1:00 - 5:30 p.m., Pacific
- Mandeville Auditorium, UC San Diego
- Free and open to the public (registration is required)
- Live webcast
- For more information or to register, visit: <https://carta.anthropogeny.org/symposia/upcoming>



Center for Academic Research and Training in Anthropogeny
"to explore and explain the origins of the human phenomenon"

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A Visual Tour of the 2016 Anthropogeny Field Course

On July 20th, 2016, five Ph.D. students from UC San Diego's Anthropogeny Graduate Specialization, embarked for Ethiopia and Tanzania for a three-week educational-adventure-of-a-lifetime as participants in the Anthropogeny Field Course, a special summer session elective. This year's participants were Kyle Fischer (Neurosciences), Whitney Friedman (Cognitive Science), Landon Klein (Neurosciences), Emily Little (Psychology), and Camille Toarmino (Psychology).

The course, led by Pascal Gagneux (UC San Diego) and Alex Piel (Liverpool John Moores University, England), is designed to introduce the students to the ecological context of human adaptation and the three major approaches to studying the origins of our species in the field: fossil evidence, comparative biology, and ethnography of human foragers.

In Ethiopia, the students met with famed researchers, and CARTA members, Drs. Berhane Asfaw and Sileshi Semaw at the National Museum. There, they toured 8 million years of fossil evidence, including important hominin fossils, observed fossil preparation,

and learned about hominin stone tool use and current research.

The remainder of the course was conducted in Tanzania, a country rich in diversity of landscape, human culture, and animals, and features many important locations in human evolution. The students witnessed the Rift Valley, a massive geological formation resulting from past tectonic and volcanic activity. They visited the Ngorongoro Crater, Serengeti National Park, and Olduvai Gorge. This was followed by three days of observing and interacting with the Hadza foragers, one of the few remaining hunter-gatherer populations. Next, the students travelled to the shores of Lake Tanganyika to observe chimpanzees, baboons, guenons, and red colobus monkeys at Gombe Stream National Park, made famous by Jane Goodall. The course wrapped up with a four-day session at the Ugalla Primate Project in Issa Valley where they were further immersed in primatology research.

Please enjoy this visual tour of the students' experiences.



Visiting the National Museum in Addis Ababa, Ethiopia and its many famous hominin fossils.



Dr Berhane Asfaw demonstrates fossil preparation.



Acacia thorns may deter browsing by bovids, but this elephant is underterred.



Masai giraffe in the Serengeti.



"River horses" in Ngorongoro Crater.



Lions digesting their meal.



Wildebeest, among the ~ 25,000 large mammals in Ngorongoro Crater, Tanzania.



Cheetah mother and cub near Nduku Lake, Tanzania



Plaque commemorating the first hominin fossil found in Africa at Olduvai Gorge, Tanzania



Our guide, Douglas Simenye, holding up the Hadza "tool kit."



A baobab tree (*Adansonia digitata*), also called tree of life, as all parts of the tree are edible.



A young Hadza man making a friction fire using an arrow shaft and dry wood.



Digging for tubers with Hadza women.



The group with our Hadza hosts.



At the Gombe Stream National Park border.



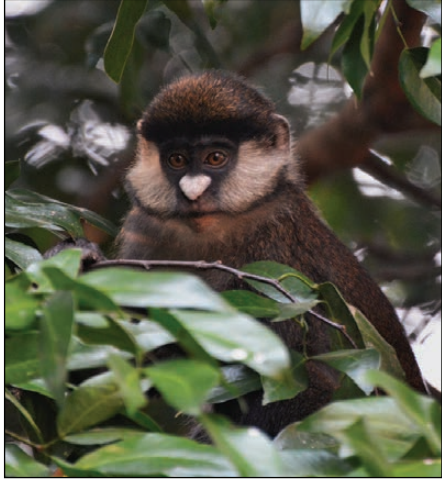
A family of chimpanzees we found grooming each other in the forest at Gombe.



A baboon at Gombe.



An elder male chimpanzee near our camp in Gombe.



A habituated red-tailed monkey at Ugalla, Tanzania.



The group with Ugalla Primate Project field assistant, Shedrack Lucas, on our last day in the field.



Goodbye for now, Africa, but not forever.

Announcing the 2016-17 Anthropogeny Fellows

CARTA is pleased to announce the 2016-17 fellowship recipients! This year, six anthropogeny students were awarded fellowships, including two recipients of the Merle-Smith Fellowship in Anthropogeny.

The recipients of the Merle-Smith Fellowship Award for 2016-17 are Sequoyah Reynoso (neurosciences) and Camille Toarmino (psychology). Sequoyah and Camille are both entering their third and final year of the Anthropogeny Specialization, and their valuable contributions to the program, enthusiasm, and open-minded curiosity about anthropogeny make them particularly deserving of this award. Established in 2015, thanks to a generous gift from long-time CARTA supporter, Annette Merle-Smith, this award is given to students who have performed at the highest level in the Graduate Specialization in Anthropogeny.

Also deserving of recognition are the students who received CARTA fellowship awards: Emily Bovino (Visual Arts), Emily Little (Psychology), Hans Peterson (Psychology), and Haleh Yazdi (Psychology). The CARTA fellowships are possible due to the generosity of The G. Harold and Leila Y. Mathers Charitable Foundation and the support from an anonymous donor.

The Graduate Specialization in Anthropogeny is a three-year program offered by the Faculty of Anthropogeny, and administered by CARTA, to UC San Diego graduate students from a variety of participating Ph.D. programs. Students enrolled in the program are required to complete the curriculum of elective courses on anthropogeny (explaining the origin of our species), participate in CARTA's scientific symposia and ensuing discussions, network with researchers from around the world, and cross-train with peers from a variety of disciplines.

Graduate students complementing a traditional degree with a specialization in anthropogeny gain valuable training in transdisciplinary research spanning sciences and humanities. Such skill and qualification greatly benefits students as they embark on future careers in both public and private sectors, where the ability to mediate between different types of knowledge bases is becoming increasingly important.

We wish to extend our sincere congratulations to this year's fellows and all Anthropogeny students for their hard work.

Emily Bovino



Emily B. is currently completing her dissertation in Art History, Theory and Criticism (concentration in Art Practice) on the concept of the "plastic."

Emily Little



Emily L. studies cultural variation in parent-infant interaction and the related implications for early social and cognitive development.

Hans Peterson



Hans' research draws on various scientific disciplines to investigate whether religious cognition has evolutionary roots.

Sequoyah Reynoso



Sequoyah's research interests include sexual attraction and selection and he is currently studying cell-surface molecules on sperm cells and their role in reproduction.

Camille Toarmino



Camille studies animal behavior with a focus on the social rules that govern non-human primate communication systems.

Haleh Yazdi



Haleh explores how individuals across cultures develop prosocial behaviors such as sharing, altruism, and cooperation.

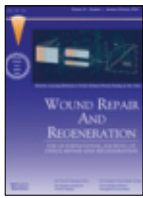
CARTA-Inspired Publications

Transdisciplinary interaction is at the core of CARTA's mission to advance human origins research. CARTA symposia provide a forum for experts from vastly different fields to share knowledge and work together to spark new research. The following is a selection of publications inspired by interactions amongst CARTA members (**in bold**) and facilitated by CARTA. (Complete list at the CARTA website.)



Antón, SC, et al. Morphological variation in *Homo erectus* and the origins of developmental plasticity. *Philos Trans R Soc Lond B Biol Sci.* 2016;371(1698).

This study explores skeletal variation in *Homo erectus* and living primates to address the hypothesis that the ability of *Homo erectus* to disperse widely stems from a human-like pattern of plasticity in response to different environments. We find that humans are not uniquely variable compared to other widely dispersed nonhuman primates and that *Homo erectus* shows less variation than previously argued.



Baird, A, Costantini, T, Coimbra, R, Eliceiri, BP. Injury, Inflammation and the Emergence of Human Specific Genes. *Wound Repair and Regeneration.* 2016;24(3):602-606.

The human immune system is uniquely suited to address the emerging need to gauge inflammation to new behaviors and sequelae like injury and infection. With uniquely-human genes expressed in immune cells and bone marrow, new animal models of human disease are needed to assess the “on-target” consequences of their expression in inflammatory disease and the significance of their “off-target” effects in other tissues.



Chan, MH, **Hawkes, K**, Kim, PS. Evolution of longevity, age at last birth and sexual conflict with grandmothering. *Journal of Theoretical Biology.* 2016;393:145-157.

In this two-sex model of the Grandmother Hypothesis, post-fertile females support only daughters' fertility; both longevity and age at last birth evolve. As in Kim et al., 2014, two locally stable equilibria result. Male competition affects transitions from great ape-like to human-like longevity while grandmothering enables that transition and affects age at last birth, but not equilibrium longevity.



Corbey, R, Jagich, A, Vaesen, K, **Collard, M**. The Acheulean handaxe: More like a bird's song than a Beatles' tune? *Evolutionary Anthropology: Issues, News, and Reviews.* 2016;25(1):6-19.

The goal of this paper is to provoke debate about the nature of an iconic artifact—the Acheulean handaxe. Specifically, we want to initiate a conversation about whether or not they are cultural objects. The vast majority of archaeologists assume that the behaviors involved in the production of handaxes were acquired by social learning and that handaxes are therefore cultural. We will argue that this assumption is not warranted on the basis of the available evidence and that an alternative hypothesis should be given serious consideration. This alternative hypothesis is that the form of Acheulean handaxes was at least partly under genetic control.



Franchini, LF, **Pollard, KS**. Can a few non-coding mutations make a human brain? *Bioessays.* 2015;37(10):1054-1061.

This review article describes the discovery of Human Accelerated Regions (HARs) and work over the past decade to elucidate the functions of these highly conserved non-coding sequences that evolved rapidly in humans since our common ancestor with chimpanzees.



Hrdy, S. Development Plus Social Selection in the Emergence of “Emotionally Modern” Humans. In: Meehan, C, and **Crittenden, A**, eds. *Childhood: Origins, Evolution, and Implications.* SAR Press and the University of New Mexico Press; 2016.

How did interest in inter-subjective engagement emerge in the hominin line? A model assuming alloparental care and provisioning explains enhanced expression of ape mind-reading potentials during development. Over generations, resulting phenotypes better at eliciting nurture would be favored by selection, eventually generating sociocognitive underpinnings critical for the emergence of language, etc.



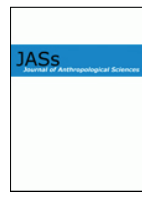
Hwang, S, et al., including **Padden, C**. Of the body and the hands: Patterned iconicity for semantic categories. *Lang Cog.* Submitted.

When communicating through visible movements of the body, do people arrive at similar solutions for conveying basic concepts like tools and animals? By examining eight sign languages with vastly different origins, we have found that the answer is yes. The common organization of the body with other humans – and even other animals – has an impact on how humans organize parts of their language.



Katoh, S, et al., including **Asfaw, B**, **Suwa, G**. New geological and palaeontological age constraint for the gorilla-human lineage split. *Nature.* 2016;530(7589):215-218.

In sub-Saharan Africa, until now, no significant mammalian fossils have been securely dated to 7.5–9 Ma. We show that new fossils from the Chorora Formation, Ethiopia, are ~7 to 9 Ma, and that *Chororapithecus* is 8.0 Ma. This supports the hypothesis of in situ African evolution of the Gorilla–Pan–human clade, and ape-human divergences based on lower mutation rates of ~0.5×10⁻⁹ per site per year.



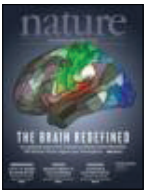
Lieberman, P. The evolution of language and thought. *J Anthropol Sci.* 2016;94:127-146.

Language serves as the medium by which the intricacies of culture are transmitted and as an instrument of thought. Its evolution involved both the recycling of neural and anatomical structures having deep evolutionary roots and genetic events specific to hominins. Theories positing human language abruptly appearing from a neural “organ” specific to humans are biologically implausible.



Locke, J. Emancipation of the voice: Vocal complexity as a fitness indicator. *Psychon Bull Rev.* 2016.

The other primates display little evidence of vocal learning or flexibility, prerequisites for spoken language. In human evolution, I propose that two changes enhanced vocal complexity and control. Increased helplessness pressured infants to emit increasingly elaborate vocalizations in their bids for attention; and expanding group size enhanced competitive signaling at sexual maturity.



Nuttle, X, et al. including **Akey, J, Gage, FH, Eichler, EE**. Emergence of a *Homo sapiens*-specific gene family and chromosome 16p11.2 CNV susceptibility. *Nature*. 2016;536:205-209.

The paper describes a human-specific gene family, *BOLA2*, that expanded at the root of *Homo sapiens*, 282,000 years ago. It is the largest genetic difference between contemporary humans and other apes including Neandertals. The duplication results in expression differences and new genes potentially important in human adaptation, but also predisposes us to one of the most common causes of autism.



Pearson, JA, et al. including **Larsen, CS**. Stable carbon and nitrogen isotope analysis and dietary reconstruction through the life course at Neolithic Çatalhöyük, Turkey. *J Soc Archaeol*. 2015;15(2):210–232.

Carbon and nitrogen isotope analysis of a large sample of human remains from the Neolithic Çatalhöyük site, Turkey, reveals significant dietary changes over the life course in this early farming community. Younger children had different diets than older children, and younger adults had different diets than older adults. Age plays a remarkably strong role in access to dietary resources.



Povinelli, DJ, Frey, SH. Constraints on the exploitation of the functional properties of objects in expert tool-using chimpanzees (*Pan troglodytes*). *Cortex*. 2016;82:11-23.

Do species other than humans check to ensure that tools have the specific properties that are vital for their function before using them? We taught our adult chimpanzees to rely on very specific functional properties of rake-like tools, but they did not test for their presence when they were not immediately apparent. This ability may have played a large role in shaping our technological culture.



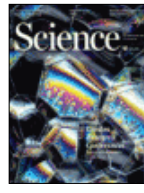
Repacholi, BM, **Meltzoff, AN, Toub, TS, Ruba, AL**. Infants' generalizations about other people's emotions: Foundations for trait-like attributions. *Dev Psychol*. 2016;52(3):364–378.

There are two types of people: Those who categorize and those who don't. We investigated the origins of human social categorization. We discovered that babies categorize people based on the emotional responses of these adults. Babies readily stereotyped someone as "an anger-prone person" and held onto that stereotype across encounters. Even before they begin to speak, babies are watching how we react and putting us into emotional pigeon-holes.



Schoeninger, MJ, Most, CA, Moore, JJ, Somerville, AD. Environmental variables across *Pan troglodytes* study sites correspond with the carbon, but not the nitrogen, stable isotope ratios of chimpanzee hair. *Am J Primatol*. 2015;78(10):1055-1069.

We explore the influence of environmental factors on chimpanzee (*Pan troglodytes*) hair sample $\delta^{13}C$ and $\delta^{15}N$ values. We show negative correlation between Mean Annual Precipitation (MAP) and $\delta^{13}C$ values across nine sites. The $\delta^{13}C$ values will indicate aspects of local ecology (biome and ecoregion) in fossil hominins from unknown ecologies. Diet selectivity, however, affects $\delta^{15}N$ values, not MAP.



Simonti, CN, et al. including **Akey, J, Capra, JA**. The phenotypic legacy of admixture between modern humans and Neandertals. *Science*. 2016;351(6274):737-741.

About 2% of the genomes of most modern non-Africans is made up of DNA derived from interbreeding with Neandertals. We used electronic health records from ~30,000 individuals of European descent to evaluate the effects of Neanderthal DNA on disease risk in modern humans. We found that Neanderthal DNA influences a range of traits relevant to disease risk in modern humans.



Tierney, JE, Ummenhofer, CC, **deMenocal, PB**. Past and future rainfall in the Horn of Africa. *Sci Adv*. 2015;1(9):e1500682.

Using an ocean sediment core from the Gulf of Aden, we show that the remarkably intense drought in the Horn of Africa region during the last century is exceptional within the context of the last 2,000 years. We show that this drying is synchronous with rising ocean temperatures in the region and rising CO2 levels, suggesting an anthropogenic origin.



Wiessner, P. The Rift between Science and Humanism: What's Data Got to Do with It? *Curr Anthropol*. 2016;57(S13):S154-S166

Cultural institutions structure violence for better or for worse, as illustrated in this analysis of two very different societies using both objective quantitative data and subjective data. The diversity of cultural conventions governing violence from society to society and time to time suggests that we cannot generalize about the nature or level of violence at any point in our evolution.



Wiggins, GA, **Tyack, P, Scharff, C, Rohrmeier, M**. The evolutionary roots of creativity: mechanisms and motivations. *Philos Trans R Soc Lond B Biol Sci*. 2015;370(1664).

We use songs of birds and whales to address the question of how to distinguish between songs that are creative vs merely novel. Singers and their audiences are part of vocal cultures that learn how their songs are patterned. These expectations can be quantitatively modeled to test whether an audience particularly appreciates new songs that generate positive tension by violating expectations within a specific range.



Varki, A. Why are there no persisting hybrids of humans with Denisovans, Neanderthals, or anyone else? *Proc Natl Acad Sci USA*. 2016;113(17):E2354.

A response to recent writings by CARTA members, inspired by discussions with many other members. This paper challenges the popular view that modern humans emerged and succeeded primarily via cumulative culture. Near-complete replacement of other hominins, lack of persistent hybrids, and invasion into all environments suggest reconsideration of a cognitive revolution, due to gene-culture co-evolution in Africa.

CARTA Member Awards and Honors

The following awards and honors were received by CARTA members during the past year.



Peter L. Tyack (Woods Hole Oceanographic Institution):

Elected Fellow of the Royal Society of Edinburgh, 2016.



Andrew Meltzoff (University of Washington):

Awarded the Kurt Koffka Medal for Excellence in Developmental Psychology, 2016.



John L. Locke (Lehman College, CUNY):

Awarded Honors in Communication Science and Disorders of the American Speech-Language-Hearing-Association, 2015.



Katie Hinde (Arizona State University):

Named to the inaugural Grist 50 in 2016.



David L. Nelson (Baylor College of Medicine):

Elected President of the American Society of Human Genetics (2018).

CARTA Symposia Schedule

Implications of Anthropogeny for Medicine and Health

October 14, 2016, UC San Diego

Awareness of Death and Personal Mortality: Implications for Anthropogeny

March 3, 2017, Salk Institute

Extraordinary Variations of the Human Mind: Lessons for Anthropogeny

May 5, 2017, Salk Institute

Cellular and Molecular Explorations of Anthropogeny

September 29, 2017, Salk Institute

CARTA on the Web



Want to re-watch a CARTA symposium? All symposia, including “Ancient DNA and Human Evolution” (April 2016), are available at the above websites.



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What is CARTA?

The UC San Diego/Salk Institute Center for Academic Research and Training in Anthropogeny (CARTA) is dedicated to answering the age old questions “where did we come from?” and “how did we get here?” As CARTA explores the origins of humanity, we are not only answering philosophical and existential questions, but also addressing very practical issues concerning human nutrition, medicine, mental disease, the organization of society, the upbringing of our young, and the interactions of humans with one another and with our environment. Transdisciplinary interaction is at the core of CARTA’s mission to advance human origins research.

For more information, please visit <https://carta.anthropogeny.org>

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